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EXAMINER

RIVERO, MINERVA

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 09/903,055
Filing Date: July 11, 2001
Appellant(s): WEISE, DAVID N.

Theodore M. Magee

For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 11/14/05 appealing from the Office action mailed 7/25/05.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The amendment after final rejection filed on 9/15/05 has been entered.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5,418,717	Su et al.	5-1995
4,868,750	Kucera et al.	9-1989

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-3 and 6-8 are rejected under 35 U.S.C. 102(b) as being anticipated by Su et al. (US Patent 5,418,717).
3. Regarding claim 1, Su et al. disclose a method of generating a score for a node identified during a parse of a text segment, the method comprising:

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identifying a phrase level for the node (*decomposing sentence into phrase levels*, Col. 13, Lines 22-33);

identifying a word class for at least one word that neighbors a text spanned by the node (*analyzing input text for part-of-speech*, Col. 9, Lines 32-40; *examining words to the left and right of the current word*, Col. 9, Lines 44-49) and

generating a score by determining a mutual information metric based on the phrase level and the word class (*composite scores*, Col. 5, Lines 8-14; *syntactic score*, Col. 9, Lines 32-40 and Col. 13, Lines 34-37; *a conditional probability may be obtained for a syntactic score of a symbol based on its right and left contexts*, Col. 13, Lines 40-44)

4. Regarding claim 2, Su *et al.* disclose identifying a word class for a word to the left of the text spanned by the node and identifying a word class for a word to the right of the text spanned by the node (*examining words to the left and right of the current word*, Col. 9, Lines 44-49).

5. Regarding claim 3, Su *et al.* disclose generating a score based on the phrase level of the node, the word class of the word to the right of the text spanned by the node and the word class of the word to the left of the text spanned by the node (*composite scores*, Col. 5, Lines 8-14; *syntactic score*, Col. 9, Lines 32-40 and Col. 13, Lines 34-37; *examining words to the left and right of the current word*, Col. 9, Lines 44-49).

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6. Regarding claims 6 and 8, *Su et al.* further disclose identifying all possible word classes for at least one word, for a word to the left of the text spanned by the node and for a word to the right of the text spanned by the node (*part-of-speech, categories of prior words*, Col. 11, Lines 44-50; *examining words to the left and right of the current word*, Col. 9, Lines 44-49; *examining context information near the current word*, Col. 11, Lines 52-54).

7. Regarding claim 7, *Su et al.* disclose generating a score based in part on all of the identified word classes (*lexical score and probability of a word having a category or part-of-speech*, Col. 11, Lines 46-50).

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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9. Claims 5, 10, 12-19 and 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Su et al.* ((US Patent 5,418,717) in view of *Kucera et al.* (US Patent 4,868,750).

10. Regarding claims 10 and 19, *Su et al.* further disclose a parser and computer-readable medium for generating a syntax structure from a text segment, comprising:

a seeding unit for inserting words from the text segment into a candidate list as nodes (*parsing using grammatical relevancy*, Col. 2, Lines 13-21; *storing candidates most likely to be correct*, Col. 6, Lines 6-9 and 11-17);

a node selector for promoting nodes from the candidate list to a node chart (*storing candidates most likely to be correct*, Col. 6, Lines 6-9 and 11-17);

a rule engine for combining nodes in the node chart to form a larger node (*parsing using grammatical relevancy*, Col. 2, Lines 13-21; *score function engine*, Col. 10, Lines 48-53, Fig. 3A, element 311) and

a metric calculator for generating a score for a node formed by the rule engine, the score being based in part on mutual information determined based on a phrase level of the node formed by the rule engine and at least one word in the text segment (*scores determined at node positions*, Col. 4, Lines 66-68; Col. 13, Lines 22-44; Fig. 4; *a conditional probability may be obtained for a syntactic score of a symbol based on its right and left contexts*, Col. 13, Lines 40-44) and

using the score for the syntax node when forming the full parse structure (generating and truncating syntax trees on the basis of node scores, Col. 4, Lines 61-68).

However, Su *et al.* do not disclose but Kucera *et al.* suggest the score being based in part on mutual information (*collocational probability*, Col. 2, Lines 28-34).

Therefore it would have been obvious to one ordinarily in the art at the time of the invention to supplement the teachings of Su *et al.* with generating a score by determining a mutual information metric, as suggested by Kucera *et al.*, in order to have the adjacent words and context regarding the node affect the scoring process and produce a more accurate and complete node score.

11. Regarding claims 5, Su *et al.* do not disclose but Kucera *et al.* do disclose determining a mutual information metric comprises determining a mutual information metric based on the phrase level of the node, the word class of the word to the right of the text spanned by the node and the word class of the word to the left of the text spanned by the node (*phrase identification*, Col. 3, Lines 3-11; *ranking per phrase boundaries*, Col. 25, Lines 27-33; *adjacent tags*, Col. 1, Lines 51-55; Col. 1, Line 65 – Col. 2, Line 3; *major class headers for tags*, Fig. 4).

Therefore it would have been obvious to one ordinarily skilled in the art at the time of the invention to supplement the teachings of Su *et al.*, with determining a mutual information metric based on the phrase level of the node, the word class of the word to the right of the text spanned by the node and the word class of the word to the left of the

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text spanned by the node, as taught by Kucera *et al.*, in order to include relevant context information in the node score metric and thus ascertain a more accurate and complete node score.

12. Regarding claim 12, Su *et al.* do not but Kucera *et al.* do disclose the mutual information is determined based on a word class for a word in a text segment (*determining probable tags in order of likelihood*, Col. 1, Line 65 – Col. 2, Line 3; *major class headers for tags*, Fig. 4).

Therefore it would have been obvious to one ordinarily skilled in the art at the time of the invention to supplement the teachings of Su *et al.* with determining the mutual information based on a word class for a word in a text segment, as disclosed by Kucera *et al.*, in order to account for relevant grammatical information in the scoring procedure, thus resulting in a more accurate and informed node score.

13. Regarding claim 21, Su *et al.* disclose the mutual information score is further based on all possible word classes of a word in the text segment (*a conditional probability may be obtained for a syntactic score of a symbol based on its right and left contexts*, Col. 13, Lines 40-44; Col. 17, Lines 47-66, Figure 7; Col. 11, Lines 46-50).

14. Regarding claim 13, Su *et al.* do not disclose but Kucera *et al.* do disclose the mutual information is determined based on all possible word classes for a word in the text segment (*annotating each word with possible tags*, Col. 1, Line 65 – Col. 2, Line 3).

Therefore it would have been obvious to one ordinarily skilled in the art to supplement the teachings of Su *et al.* with having the mutual information determined based on all possible word classes for a word in a text segment, as taught by Kucera *et al.*, in order to achieve a better parsing result by considering all the reasonable word class possibilities.

15. Regarding claims 14-15 and 22, Su *et al.* do not disclose but Kucera *et al.* do disclose the mutual information is determined based on a word class for a word to the left/right of a set of words spanned by the node formed by the rule engine (*adjacent tags*, Col. 1, Lines 51-55; Col. 1, Line 65 – Col. 2, Line 3; *major class headers for tags*, Fig. 4).

Therefore it would have been obvious to one ordinarily skilled in the art at the time of the invention to supplement the teachings of Su *et al.*, with determining a mutual information metric based on a word class for a word to the left/right of a set of words spanned by the node formed by the rule engine, as taught by Kucera *et al.*, in order to include relevant context information in the node score metric and thus ascertain a more accurate and complete node score.

16. Regarding claim 16, Su *et al.* further disclose a lexicon look-up for determining parts of speech for words in the text segment (Col. 5, Lines 65-68).

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17. Regarding claim 17, Su *et al.* do not explicitly disclose but Kucera *et al.* do disclose the seeding unit inserts a node for each part of speech of each word in the text segment (*annotating each word with possible tags*, Col. 1, Line 65 – Col. 2, Line 3; *nodes*, Col. 2, Lines 43-46; *inserting tags in node structures*, Col. 26, Lines 25-28; Fig. 13, step 180).

18. Regarding claim 18, Su *et al.* further disclose the seeding unit inserts nodes representing the beginning of the text segment and the ending of the text segment (*terminal nodes*, Col. 13, Lines 26-31).

(10) Response to Argument

1. Regarding claims 1-3, 6, and 8, Applicant argues that Su does not suggest employing a mutual information metric as part of the parsing process being that Su never refers to the disclosed Syntactic Score (see Su, Col. 13, Lines 6-61) as mutual information. The Examiner agrees that Su does not denominate the Syntactic Score disclosed as mutual information. However, this does not impede the Syntactic Score disclosed by Su of its ability to suggest a mutual information metric for a node based on a phrase level and a word class, as disclosed by Applicant. It is well known in the art that the mutual information I between two events X and Y contains terms of conditional probabilities and is calculated as follows:

$$I(X; Y) = \sum_{x,y} p(y) * p(x|y) * [\log[(p(x|y)) / p(x)]],$$

(conditional probabilities $p(x,y)$ emphasized). This expression for mutual information is commonly simplified and further expressed as the following equivalent expression (see similar expression in Applicant's Arguments, Page 6):

$$I(X; Y) = \sum_{x,y} p(x,y) * \log [(p(x,y)) / (p(x)p(y))].$$

Thus, mutual information, by its very nature, includes a conditional probability measurement of the events in question. This is, de facto, evidenced by Applicant's disclosure in Page 20, Lines 1-21 (see Eq. 5), wherein Applicant discloses that for the case in which all the possible classes for the words left and right of the node in question are taken into consideration, the mutual information metric is expressed as:

$$I(node) = \sum_{left\ classes} \sum_{right\ classes} P(wc_l|word_l) P(wc_r|word_r) I(wc_l, PL_{node}, wc_r).$$

Note conditional probability terms $P(wc_l|word_l)$ and $P(wc_r|word_r)$. [These additional elements to be factored into the mutual information metric are particular to the embodiments of claims 6 and 7, which depend on and further limit claim 1.] Su's Syntactic Score, like Applicant's mutual information score, is not a mere conditional probability measure but a metric partly composed of conditional probabilities, refer to Col. 13, Lines 34-40, wherein Su discloses the syntactic score may be calculated as the

product of probabilities and that these probabilities may be simplified into conditional probabilities. Su's Syntactic Score suggests Applicant's Mutual Information Score because a statistical measurement is being made in order to determine a likelihood of occurrence (*a scoring based on compliance of a node in question with respect to grammatical rules*) for a node (*each higher node or phrase level being a sequence of tagged or classified words added upon as the parsing progresses*) given the context (*i.e. words right and left of the node and their respective possible classifications*), and the phrase level of the node, therefore said statistical measurement being necessarily based on conditional probabilities and in both cases having the same objective.

[**Conditional probability** is the probability of some event A, given that some other event, B, has already occurred.] Thus, in order to obtain a combined likelihood of the joint occurrence of all the elements/events being parsed, conditional probabilities are calculated with respect to all the possibilities, and compounded to form a metric that yields a rank for each possibility. Furthermore, compare the terms l_1 (*left word*), r_1 (*right word*), c_1 (*lexical category of word 1*) and L_8, L_7 , etc. (*phrase level of the node*) in Col. 13, Lines 45-60 of Su's disclosure to the terms wc_l (*word class of left word*), wc_r (*word class of right word*), $word_l$, and PL_{node} (*phrase level of the node*) of Applicant's disclosure in Page 20, Eqs. 3, 4 and 5. In both cases, in order to account for multiple class possibilities for each of the chosen number of words left and right of the node, as well as for previously occurring phrase levels, a compounded statistical metric results, that is neither a simple mutual information metric nor conditional probability. Moreover, while the specific mathematical definitions of Applicant's mutual information

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metrics/scores are not being claimed, the broader mutual information per se is a well-known statistical tool, which is commonly used in corpus linguistics.

2. Regarding claims 5, 10, 12 and 14-19, Applicant argues that neither Kucera nor Lu suggest generating a mutual information metric based on a phrase level, since collocational probability does not suggest mutual information. The Examiner cannot concur with the Applicant. Kucera suggests generating a mutual information metric based on the phrase level (see Kucera, *collocational probability*, Col. 2, Lines 28-34). Collocation information and mutual information are well-known in the art as statistical alternatives that fulfill a part-of-speech disambiguation purpose, therefore the use of a collocation probability can suggest the use of a mutual information metric in the corresponding art.

3. Regarding claim 7, Applicant argues that neither Su nor Kucera disclose 'generating a score based [in part] on all of the identified word classes', and that instead Su discloses generating separate scores, which are never combined. The Examiner cannot concur with the Applicant. Su discloses that the lexical score is a component of a higher-level score function (see Su, Col. 11, Lines 42-44, and *lexical score and probability of a word having a category or part-of-speech*, Col. 11, Lines 46-50; Col. 11, Lines 6-15), and discloses that all possible parts-of-speech for a word are considered (see *weighted lexical category, finding additional lexical categories, and retaining the highest ranked sequence*, Su, Col. 18, Lines 1-49). The lexical score disclosed by Su

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generates a score that is based in part on all of the identified word classes because, firstly, all the possible lexical categories for a word are accounted for, and, secondly, when obtaining the final score for a word sequence, the lexical categories for each word in the sequence have been weighted, so that the final score reflects a level of certainty of the selected tagging/parsing. That is, if the word 'rose' has three possible categories, noun, verb or adjective, with probabilities of 0.60, 0.30 and 0.10 respectively, given the context (*or master text*), the chosen category will be the one with the highest probability, i.e. noun, and because it is a weighted lexical score the overall score for the node in question will therefore reflect the fact that there is only a 60% probability of noun being the proper classification for 'rose' given the context. Therefore, the score generated by Su is a score that is based in part on all possible word classes identified for a word.

4. Regarding claims 13, and 21-2, Applicant argues that neither Su nor Kucera disclose mutual information is determined based on all possible word classes for a word in the text segment. The Examiner cannot concur with the Applicant. Both Su and Kucera disclose said limitation [For Su's disclosure see explanation above regarding Claim 7]. Kucera discloses annotating each word with a sequence of possible grammatical tags (see Kucera, Col. 1, Line 65) in similar fashion to Su. Furthermore the tags are ranked in order of likelihood, and all classes/tags for a word are accounted for in the likelihood ranking because for a word with two possible classifications a preference for one classification will result in proportionate rejection of another.

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Therefore all the possible identified classes for a word are used in generating the final likelihood or score.

For the above reasons, it is believed that the rejections should be sustained.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

MR 1/2/06



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